PORTFOLIO MANAGEMENT

10.5.2008

TIME: 5 h
Calculator can be used

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1. You have the following information:

	Expected return	Return standard deviation	Correlations A	B	M
Stock **A**	9.5%	20%	1.0	0.2	0.4
Stock **B**	18.0%	30%	0.2	1.0	0.7
Market portfolio **M**	11.0%	10%	0.4	0.7	1.0
Riskless asset	5.0%	0%			

a.) What is the expected return and standard deviation of a portfolio where you have invested 20% in stock **A**, 40% in stock **B**, 30% in the market index **M**, and the remaining 10% in the risk-free rate ?

c.) Calculate the betas for stocks **A** and **B**. Are the stocks correctly priced according to the CAPM, or are they over / undervalued ?

d.) How much (how many percentages) of the total risk i.e. variance of stock **B** consists of unique risk and how much of systematic risk ?

(20 p)

2. a.) Assume that all stocks have a return standard deviation of 30%, and that the pairwise correlation between the returns on any two stocks is +0.6. Calculate the standard deviation of the return on an equally weighted portfolio consisting of a very large number of stocks.

b.) Assume that two stocks X and Y have expected returns of 11% (X) and 4% (Y), and that the standard deviations of the stock returns are 30% (X) and 20% (Y). The correlation between the returns on stocks X and Y is -1. Calculate the return and standard deviation of the minimum variance portfolio constructed by these two stocks. The risk free rate in this exonomy is 6%. Would there be arbitrage opportunities such an economy ?

c.) Calculate, for stocks A, B, and the market portfolio M from question 1, the following performance evaluation measures: the Sharpe ratio, Jensen's alpha, and the Treynor measure.

(20 p)

3. a.) Consider the following investment:

- 1.) Two years ago, you bought stocks for 100.000.-
- 2.) One year ago, the value of your portfolio was 120.000.- Then you invested 40.000.- more into the stocks of the same company.
- 3.) Today, the value of your portfolio is 178.250.-.

Compute the return using the formula for a.) the internal rate of return (yield, a "dollar weighted return"), and b.) geometric return (a time weighted return). Why do the results differ, and which one would you prefer in general if you worked as a fund manager for a client putting randomly money in and out of the fund ? (10 p)

3. b.) Determine whether the following statements are right or wrong (you can also leave subquestions unanswered). For **right** answers, 1 p is obtained. For **wrong** anwers -1 p is obtained. The overall sum cannot however be negative.

a.) Diversification benefits are highest when combining uncorrelated assets.
b.) Alfa measures unique risk.
c.) Beta measures market risk.
d.) An asset's beta coefficient can be negative.
e.) Volatility measures total risk.
f.) Stocks below the Capital Market Line (CML) are overpriced.
g.) Stocks above the Security Market Line (SML) are underpriced.
h.) A geometric return can be calculated by taking the arithmetic average of single period
percentage returns.
i.) A zero-investment opportunity with a positive alpha could rise if an arbitrage opportunity exists.
j.) Tracking error volatility can be negative, zero, or positive.

(10 p)

4. A Finnish investor currently allocates 80% of his funds in the risk free asset and 20% into Finnish equities. The Finnish equities have an expected return of 10% and a volatility of 20% p.a. The world market portfolio, excluding Finland, has an expected return of 8% and a volatility of 15% p.a., measured in local currency, i.e. euros. Correlation between Finnish equities and the world market is about 0.7. The euro-denominated risk free rate is 4% p.a.

a) The investor now considers international diversification by including the world market portfolio (ex-Finland) but wants to maintain constant portfolio volatility. Which portfolio should he invest in? (15p)

b) What can you say about the level of constant relative risk aversion of this investor? (5p)

(20 p)

5. Short questions:

a.) Beta and standard deviation are both risk measures. Explain which of them is important for the **pricing** of individual stocks, and why.

b.) "Weak form market efficiency implies that the correlation between subsequent daily returns on a stock should be negative." Right or wrong (motivate your answer) ?

c.) Explain briefly what is meant by the "momentum strategy".

d.) Given that proponents of the "Behavioural Finance"-school of right, how would it change portfolio management practices in your opinion? Discuss briefly.

e.) Explain briefly why Initial Public Offerings might be interesting for portfolio managers.

(5 * 4 p.)

Formulas:

(#1):

$$w_m^* = \frac{E[r_m]-rf}{A^*\sigma^2_m}$$

(#2):

$$w_S = \frac{\sigma^2_B - \sigma_{B,S}}{\sigma^2_B - 2\sigma_{B,S} + \sigma^2_S} + \frac{[E_S - E_B]}{A(\sigma^2_B - 2\sigma_{B,S} + \sigma^2_S)}$$

where E_S, E_B expected returns on stocks and bonds, and σ^2_S, σ^2_B, $\sigma_{B,S}$ are variances and covariance between S and B. rf is the riskfree rate. A is the coefficient of constant relative risk aversion.

(#3):

$$w_S = \frac{[E_S - rf]^*\ \sigma^2_B - [E_B - rf]^*\ \sigma_{B,S}}{[E_S - rf]^*\ \sigma^2_B + [E_B - rf]^*\ \sigma^2_S - \{(E_S - rf) + (E_B - rf)\}^*\ \sigma_{B,S}}$$

Note: Cov(S,B)= Corr(S,B)* σ_S *σ_B and $w_B = 1 - w_S$.

(#4): 1-factor market model holds (in excess returns)

$$r_{it} = \alpha_i + rf + \beta_i^*(r_{mt} - rf) \quad + \quad e_{it}$$

Systematic risk | Unsystematic risk

α_i measures the superior (abnormal) return that the active security may have! e_{it} is assumed to have mean zero and has variance of σ_{ie}^2. Appying to #3. with S=x=the active security and B=y=passive benchmark:

$Ex = \alpha_x + rf + \beta_x^*(E[r_m] - rf)$ $\qquad$ $Ey = E[r_m]$

$Var(x) = \beta_x^{2*}\sigma_m^2 + \sigma_{xe}^2$ $\qquad$ $Var(y) = \sigma_m^2$

$Cov(x,y) = Cov(x,m) = \beta_x^*\sigma_m^2$

$$\boxed{w_x = \frac{\alpha_x^*\sigma_m^2}{\alpha_x^*\sigma_m^{2*}(1-\beta_x) + [E[r_m]-rf]^*\sigma^2_{xe}}}$$

and $w_y = w_m = 1 - w_x$.

$$w_x = \frac{w_0}{1 + (1-\beta_x)^* w_0} \qquad \text{where } w_0 = \frac{\alpha_x/\sigma_{xe}^2}{(E[r_m]-rf)/\sigma_m^2}$$

#5.

$$\beta_p^* = \frac{E[r_m] + a + b\alpha_m - rf}{A^*(1-\rho^2)^*\sigma^2(r_m)}$$